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APPLICATION NO.	FILING DATE	FIRST NAMED INVENTOR	ATTORNEY DOCKET NO.	CONFIRMATION NO.
09/761,594	01/16/2001	Hans-Jurgen Hacke	GR 98 P 4137 P	5815

7590

08/19/2003

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21
EXAMINER

HARAN, JOHN T

ART UNIT

PAPER NUMBER

1733

DATE MAILED: 08/19/2003

Please find below and/or attached an Office communication concerning this application or proceeding.

Office Action Summary

Applicant N .

09/761,594

Applicant(s)

HACKE ET AL.

Examiner

John T. Haran

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-- The MAILING DATE of this communication appears on the cover sheet with the correspondence address --

Period for Reply

A SHORTENED STATUTORY PERIOD FOR REPLY IS SET TO EXPIRE 3 MONTH(S) FROM THE MAILING DATE OF THIS COMMUNICATION.

- Extensions of time may be available under the provisions of 37 CFR 1.136(a). In no event, however, may a reply be timely filed after SIX (6) MONTHS from the mailing date of this communication.
- If the period for reply specified above is less than thirty (30) days, a reply within the statutory minimum of thirty (30) days will be considered timely.
- If NO period for reply is specified above, the maximum statutory period will apply and will expire SIX (6) MONTHS from the mailing date of this communication.
- Failure to reply within the set or extended period for reply will, by statute, cause the application to become ABANDONED (35 U.S.C. § 133).
- Any reply received by the Office later than three months after the mailing date of this communication, even if timely filed, may reduce any earned patent term adjustment. See 37 CFR 1.704(b).

Status

- 1) ☒ Responsive to communication(s) filed on 07 July 2003.
- 2a) ☒ This action is **FINAL**. 2b) ☐ This action is non-final.
- 3) ☐ Since this application is in condition for allowance except for formal matters, prosecution as to the merits is closed in accordance with the practice under *Ex parte Quayle*, 1935 C.D. 11, 453 O.G. 213.

Disposition of Claims

- 4) ☒ Claim(s) 1-5 and 11-24 is/are pending in the application.
- 4a) Of the above claim(s) 11, 12 and 18 is/are withdrawn from consideration.
- 5) ☐ Claim(s) _____ is/are allowed.
- 6) ☒ Claim(s) 1-5, 13-17 and 19-24 is/are rejected.
- 7) ☐ Claim(s) _____ is/are objected to.
- 8) ☐ Claim(s) _____ are subject to restriction and/or election requirement.

Application Papers

- 9) ☐ The specification is objected to by the Examiner.
- 10) ☐ The drawing(s) filed on _____ is/are: a) ☐ accepted or b) ☐ objected to by the Examiner.
- Applicant may not request that any objection to the drawing(s) be held in abeyance. See 37 CFR 1.85(a).
- 11) ☐ The proposed drawing correction filed on _____ is: a) ☐ approved b) ☐ disapproved by the Examiner.
- If approved, corrected drawings are required in reply to this Office action.
- 12) ☐ The oath or declaration is objected to by the Examiner.

Priority under 35 U.S.C. §§ 119 and 120

- 13) ☒ Acknowledgment is made of a claim for foreign priority under 35 U.S.C. § 119(a)-(d) or (f).
- a) ☒ All b) ☐ Some * c) ☐ None of:
1. ☒ Certified copies of the priority documents have been received.
 2. ☐ Certified copies of the priority documents have been received in Application No. _____.
 3. ☐ Copies of the certified copies of the priority documents have been received in this National Stage application from the International Bureau (PCT Rule 17.2(a)).
- * See the attached detailed Office action for a list of the certified copies not received.
- 14) ☐ Acknowledgment is made of a claim for domestic priority under 35 U.S.C. § 119(e) (to a provisional application).
- a) ☐ The translation of the foreign language provisional application has been received.
- 15) ☐ Acknowledgment is made of a claim for domestic priority under 35 U.S.C. §§ 120 and/or 121.

Attachment(s)

- | | |
|--|---|
| 1) <input type="checkbox"/> Notice of References Cited (PTO-892) | 4) <input type="checkbox"/> Interview Summary (PTO-413) Paper No(s). _____ |
| 2) <input type="checkbox"/> Notice of Draftsperson's Patent Drawing Review (PTO-948) | 5) <input type="checkbox"/> Notice of Informal Patent Application (PTO-152) |
| 3) <input type="checkbox"/> Information Disclosure Statement(s) (PTO-1449) Paper No(s) _____ | 6) <input type="checkbox"/> Other: _____ |

DETAILED ACTION

1. This Office Action is in response to the amendment and arguments filed on 7/7/03.

Claim Rejections - 35 USC § 112

2. The following is a quotation of the second paragraph of 35 U.S.C. 112:

The specification shall conclude with one or more claims particularly pointing out and distinctly claiming the subject matter which the applicant regards as his invention.

3. Claims 1, 2, 13-17, and 25 are rejected under 35 U.S.C. 112, second paragraph, as being indefinite for failing to particularly point out and distinctly claim the subject matter which applicant regards as the invention.

Newly added claim 25 creates confusion for the interpretation of claim 1. Claim 1 states that the thickness of the second insulating layer, the elasticity of the conductive material, and the elasticity of the small balls result in a desired mechanical decoupling. Claim 25, states that the aforementioned variables are **selected** to obtain the desired mechanical decoupling. Before claim 25 was added, it seem implied in claim 1 that these variables were selected to obtain the desired mechanical decoupling, but now that claim 25 specifies selecting the variables, it appears claim 1 reads on any combination of thickness of the second insulating layer, elasticity of the conductive material, and elasticity of the small balls will result in a desired mechanical decoupling. Clarification is requested. Newly added claim 25 also brings into question the meaning of "desired" in claims 1 and 25 (as well as claim 3). Does it mean that it is desired to have mechanical decoupling or is it desired to have a specific degree of mechanical decoupling? If

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"desired" means a specific degree of mechanical decoupling then how is the degree of decoupling determined?

Claim Rejections - 35 USC § 103

4. The following is a quotation of 35 U.S.C. 103(a) which forms the basis for all obviousness rejections set forth in this Office action:

(a) A patent may not be obtained though the invention is not identically disclosed or described as set forth in section 102 of this title, if the differences between the subject matter sought to be patented and the prior art are such that the subject matter as a whole would have been obvious at the time the invention was made to a person having ordinary skill in the art to which said subject matter pertains. Patentability shall not be negated by the manner in which the invention was made.

5. Claims 1-5 and 13-17 and 19-25 are rejected under 35 U.S.C. 103(a) as being unpatentable over Akagawa et al (EP 734,059) in view of Farnworth et al (U.S. Patent 6,639,600), Akram et al (U.S. Patent 6,107,109) and IBM Technical Bulletin, "Solder Plated Resin Ball" pages 463-464.

Akagawa et al are directed to a chip sized semiconductor device and a process for making it comprising providing chips (32), placing electrical connection pads on the chip (36), applying a first insulating layer (38) such that the electrical connection pads are left partially uncovered, producing interconnects (40) on the first insulating film leading from the electrical connection pads (36) to a base region (43) of external connection elements; applying a second insulating layer (42) on the interconnects and the first insulating layer that is thicker than the first insulating layer; forming openings (44) in the second insulation layer above the base regions; and placing solder balls (46) in the openings and attaching them to the base regions. Akagawa et al are silent towards the balls being plastic balls having a metallic coating.

It is well known and conventional in the semiconductor art to use plastic balls having a metallic coating and an outer solder coating in place of pure solder balls because the plastic is more reliable to withstand thermal stress, as shown for example in IBM Technical Bulletin, "Solder Plated Resin Ball" page 463. It would have been obvious to one of ordinary skill in the art at the time the invention was made to use the resin ball of the IBM Technical Bulletin in the method and product of Akagawa et al in order to increase resistance to thermal stress.

Akagawa et al are also silent towards bonding the balls to the base region by placing a conductive material in the opening and attaching the ball to the connection pads via the conductive material. Akagawa et al teach bonding the solder ball to the base region through a reflow process (Column 9, line 3). It is well known and conventional to use conductive material, such as conductive adhesive, to attach balls to a surface in place of a reflow process, as shown for example in Farnworth et al (Column 11, lines 61-64) and Akram et al (Column 7, lines 43-45). The two are alternative expedients and it would have been obvious to use either and only the expected results would be achieved. It would have been obvious to one of ordinary skill in the art at the time the invention was made to place conductive material in the opening and attach a resin ball coated with metal to the base region via the conductive material in the method and product of the Akagawa et al.

Regarding claims 1, 3, and 25, it is noted that the claims do not actually require that the semiconductor component be soldered onto a printed circuit board and have the desired mechanical decoupling. The claims require that the semiconductor

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component be capable of being soldered to a printed circuit board and that there will be a mechanical decoupling upon soldering to the printed circuit board. One skilled in the art would have readily appreciated that the semiconductor component obtained from the method of Akagawa et al, as modified above, is capable of being soldered to a printed circuit board, in light of the fact that the balls have an outer layer of solder. The product of Akagawa et al, as modified above, has the various claimed properties for the second insulating layer, conductive material, and the small balls and whether specifically selected for achieving mechanical decoupling or not, one skilled in the art would have readily appreciated that only the expected results would be achieved upon soldering the component to a printed circuit board, i.e. that there will be the desired mechanical decoupling.

Regarding claims 2, 17, and 23-24, one skilled in the art would have readily appreciated that the relative thickness of the insulation layers depends upon a variety of factors and that the second insulation layer needs to be sufficiently thick to provide openings of adequate size to fill with conductive material to bond the balls to the chip. One skilled in the art would have readily appreciated that the thickness of the second insulation layer in comparison with the first insulation layer is within the purview of one skilled in the art.

Regarding claim 4, it is well known and conventional to using a doctor blade for introducing conductive adhesive into openings. It would have been obvious to use conventional means for introducing the adhesive into the openings in the method of Akagawa et al, as modified above.

Regarding claim 5, Akagawa et al teach forming the chips on a wafer and dicing the wafer after the assembly process is complete (Column 9, lines 48-57).

Regarding claims 13 and 19, Farnworth et al and Akram et al teach using conductive adhesive and curing it.

Regarding claims 14-15 and 20-21, completely metal balls and metallized plastic balls are both well known and conventional and it would have been obvious to use either.

Regarding claims 16 and 22, one skilled in the art would have readily appreciated that the opening in the second insulation layer of Akagawa et al is circular in shape to accommodate the ball and that adhesive placed in the opening would assume a cylindrical shape. It would have been obvious to one of ordinary skill in the art at the time the invention was made to place conductive adhesive in the opening and thereby assume a cylindrical shape in the method and product of the Akagawa et al.

Response to Arguments

6. Applicant's arguments filed 7/7/03 have been fully considered but they are not persuasive.

As noted above, claims 1, 3, and 25 do not actually require the semiconductor component to be soldered to the printed circuit board and have the desired mechanical decoupling, but rather require that the semiconductor component be capable of being soldered to a printed circuit board and being mechanically decoupled upon the soldering operation. The product of Akagawa et al, as modified above, is capable of being soldered to a printed circuit board, in light of the fact that the small balls have an outer

coating of solder. Furthermore, the product of Akagawa has the claimed properties of the second insulation layer, the conductive adhesive, and the small balls and only the expected results would be achieved upon soldering to a printed circuit board, namely mechanical decoupling.

Conclusion

7. Applicant's amendment necessitated the new ground(s) of rejection presented in this Office action. Accordingly, **THIS ACTION IS MADE FINAL**. See MPEP § 706.07(a). Applicant is reminded of the extension of time policy as set forth in 37 CFR 1.136(a).

A shortened statutory period for reply to this final action is set to expire **THREE MONTHS** from the mailing date of this action. In the event a first reply is filed within **TWO MONTHS** of the mailing date of this final action and the advisory action is not mailed until after the end of the **THREE-MONTH** shortened statutory period, then the shortened statutory period will expire on the date the advisory action is mailed, and any extension fee pursuant to 37 CFR 1.136(a) will be calculated from the mailing date of the advisory action. In no event, however, will the statutory period for reply expire later than **SIX MONTHS** from the date of this final action.

8. Any inquiry concerning this communication or earlier communications from the examiner should be directed to **John T. Haran** whose telephone number is **(703) 305-0052**. The examiner can normally be reached on M-Th (8 - 5) and alternate Fridays.

If attempts to reach the examiner by telephone are unsuccessful, the examiner's supervisor, Michael W. Ball can be reached on (703) 308-2058. The fax phone


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numbers for the organization where this application or proceeding is assigned are (703) 872-9310 for regular communications and (703) 872-9311 for After Final communications.

Any inquiry of a general nature or relating to the status of this application or proceeding should be directed to the receptionist whose telephone number is (703) 308-0661.


John T. Haran

August 13, 2003


Michael W. Ball
Supervisory Patent Examiner
Technology Center 1700